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Beaudoin

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(54) **LOCKING MECHANISM FOR A COVER**

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(51) **Int. Cl.**

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E05B 65/00	(2006.01)
E02D 29/14	(2006.01)
E03F 5/04	(2006.01)

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CPC E03F 5/0401; E03F 5/06; E03F 2005/063; E03F 2005/065; E02D 29/1427

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See application file for complete search history.

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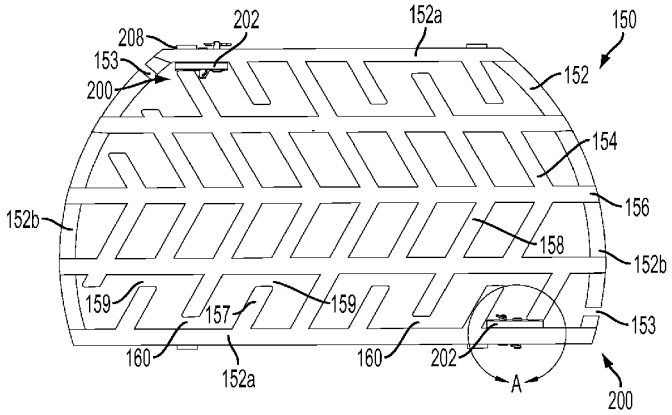
(57) **ABSTRACT**

A locking mechanism for a cover having at least a portion able to undergo elastic deformation and including at least one opening disposed at least partially in the at least portion of the cover able to undergo elastic deformation is provided. The locking mechanism includes at least one blocker movable between an open position where the at least one blocker is disengaged from the at least one opening, and a locked position where the at least one blocker is engaged in the at least one opening. In the locked position, the at least one blocker prevents at least partially elastic deformation of the at least portion of the cover. A cover and locking mechanism assembly is also provided.

11 Claims, 5 Drawing Sheets



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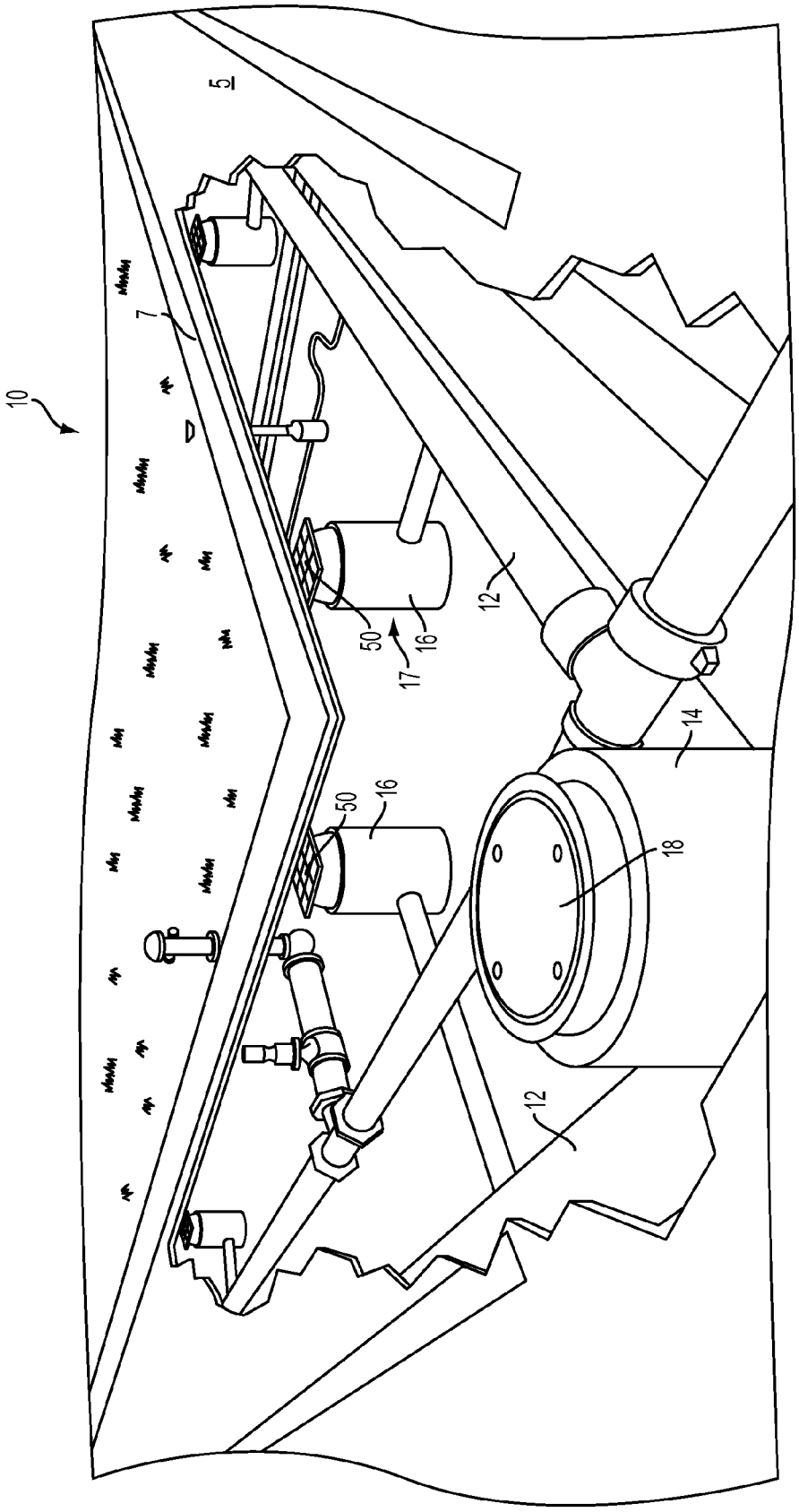


FIG. 1

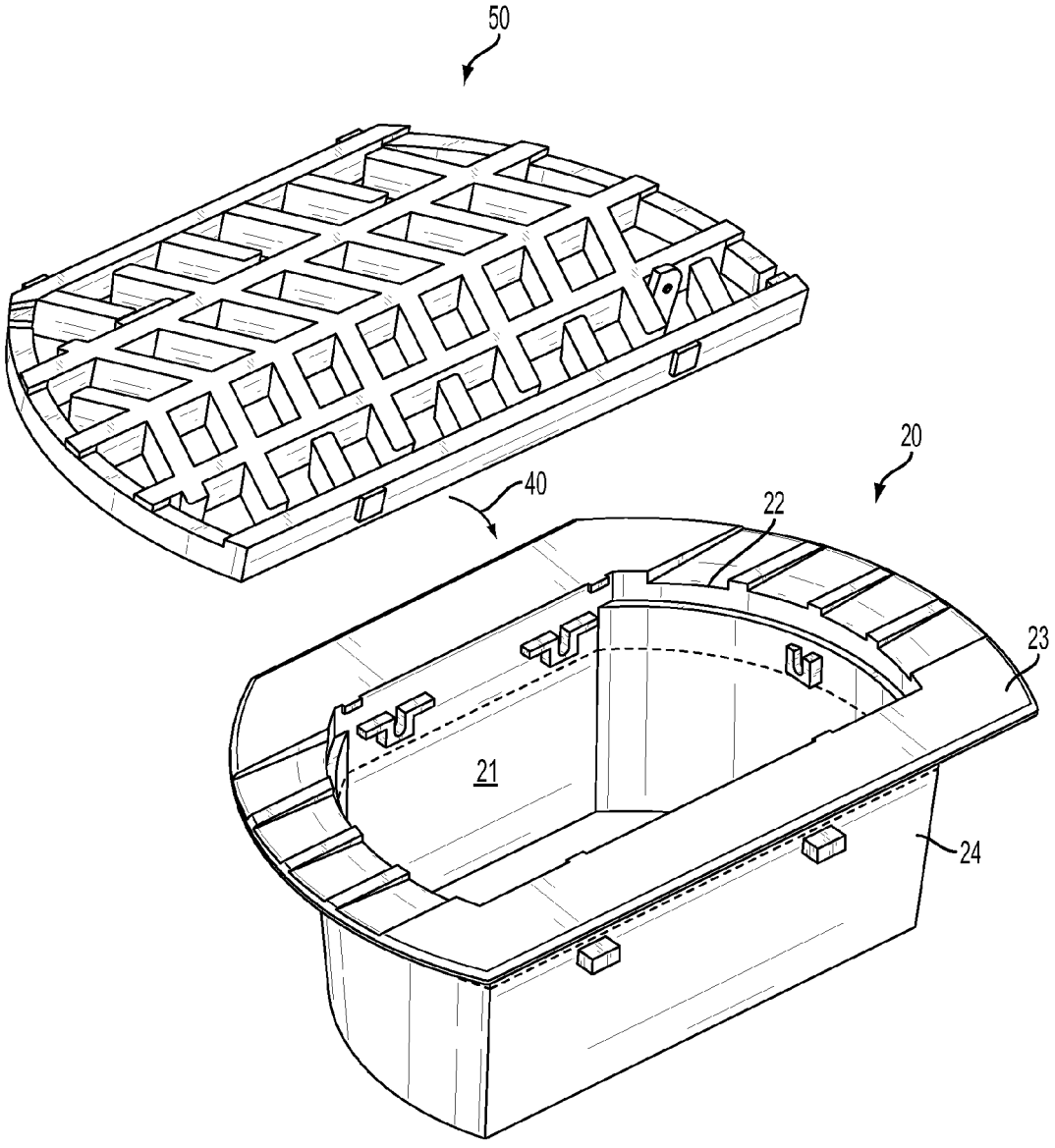
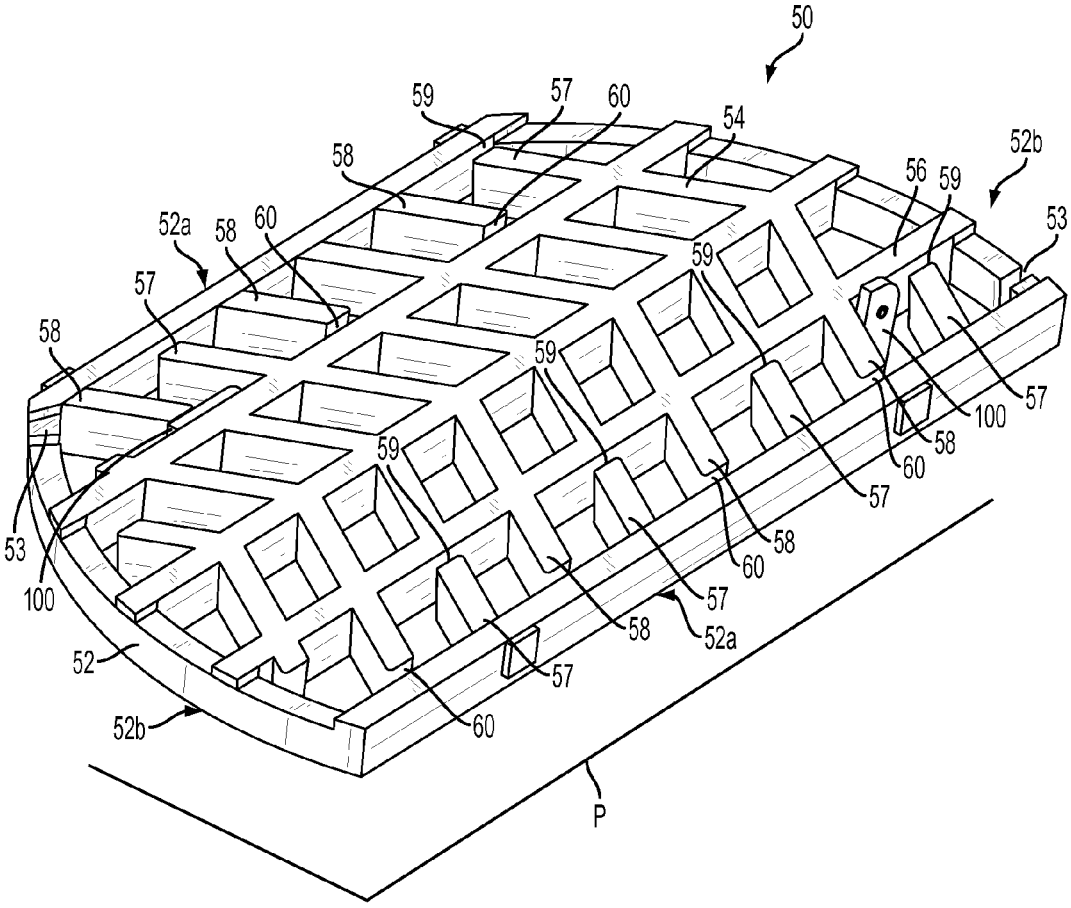


FIG. 2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52b
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P

FIG. 3

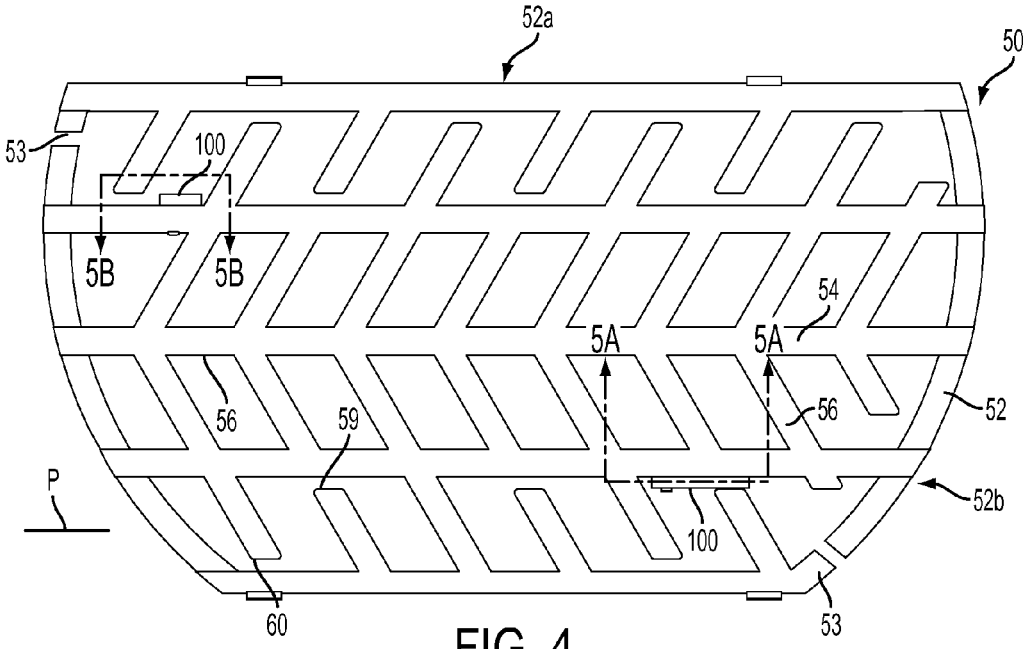

FIG. 4

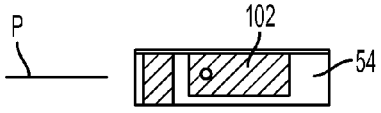

FIG. 5A

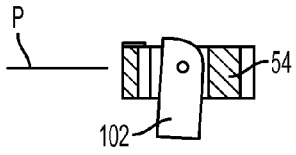

FIG. 5B

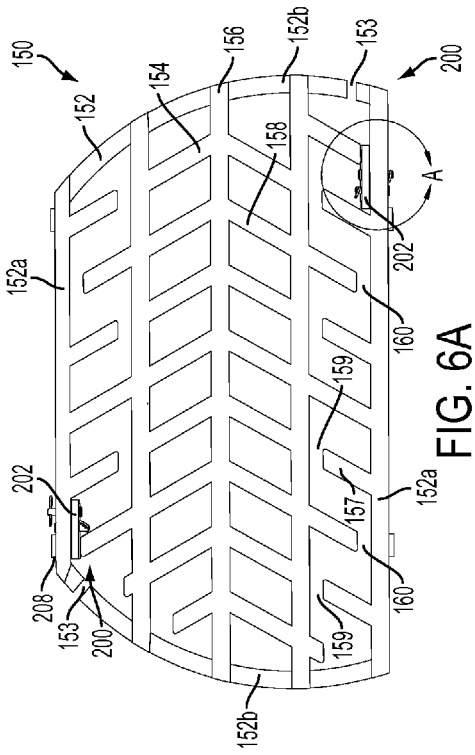

FIG. 6A

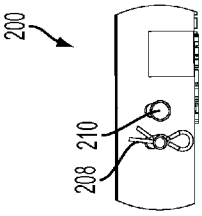

FIG. 7B

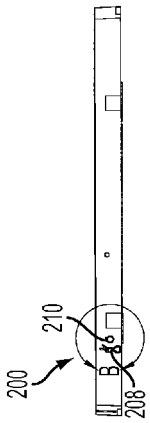

FIG. 6B

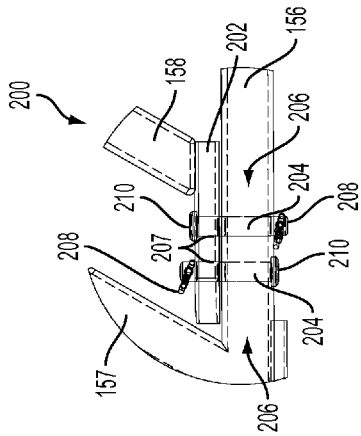

FIG. 7A

LOCKING MECHANISM FOR A COVER

TECHNICAL FIELD

The invention relates to covers and more particularly for a locking mechanism for the cover.

BACKGROUND OF THE ART

During road construction, storm drains (also known as catch basins) and sewer inlets are disposed at various points along the road to evacuate excess water and/or debris that may accumulate. Such accumulation can occur for example during rainfall.

The storm drains (or catch basins) are connected to a sewerage system which is a network of pipes, pumps, and force mains for the collection of wastewater, or sewage, from the community. Typically, storm drains use a separate and distinct sewerage network from sanitary sewer systems for human waste. Sometimes a combined system provides only one network for all types of sewage and excess water or debris.

In order to evacuate the excess water and debris toward the sewerage system, the storm drain includes an inlet disposed on the road surface. Two main types of inlets exist: the side inlet and the grated inlet. The sewerage typically ends in an outlet for the water which is a single large exit at the point of discharge. The separation of storm sewers from sanitary sewers helps to prevent sewage treatment plants becoming overwhelmed by infiltration/inflow during a rainstorm, which can result in untreated sewage being discharged into the environment.

The grated inlets prevent pedestrians, vehicles and large objects from falling into the storm drain. The design of the grate bars facilitates a flow of water towards the inside of the drain. Storm drains provided in streets and parking areas must be strong enough to support the weight of the vehicles. Some of the heavier sediment and small objects or debris may enter the grated inlet and settle in the catchbasin below the inlet. A frame is provided for the catchbasin or catch pit and the grate covers the open top of the frame of the catchbasin.

The grate is usually made of a ductile iron material and is simply fit flush with the open top of the frame. The grate has to be able to sustain different types of loads and different weather conditions. When a road is deviated from its usual path, the frame and grate may experience a traffic greater than it is normally exposed to. In some cases, the traffic forces the grate out of the frame, leaving the conduit or pipe head exposed, and thereby revealing a hole in the road. Having the conduit head exposed can become problematic for the road users.

In order to prevent the grate from detaching from the frame, some have solidified the grate to the frame. While this may allow the grate to stay connected to the frame, it prevents later access to the conduit for maintenance of the sewerage system.

Others have installed weights hanging downward from the grate in the conduit to weight the grate down toward the frame. However, these weights make it difficult for the grate to be removed during maintenance.

SUMMARY

Accordingly, there is provided a locking mechanism for a cover. The cover has at least a portion able to undergo elastic deformation. The cover includes at least one opening disposed at least partially in the at least portion of the cover. The locking mechanism includes at least one blocker movable between an open position where the at least one blocker is disengaged from the at least one opening, and a locked position where the at least one blocker is engaged in the at least one opening. In the locked position, the at least one blocker prevents at least partially elastic deformation of the at least portion of the cover.

In one embodiment, the at least one blocker is at least one latch pivotally connected to the cover.

In one embodiment, in the open position, the at least one latch is adapted to be at an angle with respect to the cover, and in the locked position, the at least one latch is adapted to be aligned with the cover.

In one embodiment, a thickness of the at least one blocker corresponds to a width of the at least one opening.

There is also provided a cover and locking mechanism assembly comprising a cover including at least a portion able to undergo elastic deformation. The cover includes at least one opening disposed at least partially in the at least portion of the cover. A locking mechanism includes at least one blocker movable between an open position where the at least one blocker is disengaged from the at least one opening, and a locked position where the at least one blocker is engaged in the at least one opening. In the locked position, the at least one blocker prevents at least partially elastic deformation of the at least portion of the cover.

In one embodiment, the cover is a grate. The grate includes a frame and a plurality of crisscrossly arranged bars extending within the frame.

In one embodiment, at least one of the at least one blocker and the cover is made at least partially of ductile iron.

In one embodiment, the at least one blocker includes at least one latch pivotally connected to the cover.

In one embodiment, the cover defines a longitudinal plane. In the open position, the at least one latch is at an angle with respect to the longitudinal plane, and in the locked position, the at least one latch is contained in the longitudinal plane.

In one embodiment, a thickness of the at least one blocker corresponds to a width of the at least one opening.

In one embodiment, the at least one opening is disposed between two adjacent bars of the plurality of crisscrossly arranged bars.

In one embodiment, the at least portion able to undergo elastic deformation is at least one first portion. The at least one opening is at least one first opening. The grate includes at least one second portion able to undergo elastic deformation. The grate includes at least one second opening disposed at least partially within the at least one second portion.

In one embodiment, the at least second portion able to undergo elastic deformation and the at least one second opening are disposed within the frame.

In one embodiment, the at least second portion able to undergo elastic deformation and the at least one second opening are disposed within the plurality of crisscrossly arranged bars.

In one embodiment, the plurality of crisscrossly arranged bars forms a chevron pattern.

Embodiments of the present can have at least one of the above-mentioned aspects, but do not necessarily have all of them.

Additional and/or alternative features, aspects, and advantages of embodiments of the present will become apparent from the following description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Having thus generally described the nature of the invention, reference will now be made to the accompanying draw-

ings, showing, by way of illustration, embodiments, aspects and features thereof and in which:

FIG. **1** is an illustration of a road partially cut out to reveal a sewerage system including a plurality of manholes and drains with their respective drains;

FIG. **2** is a perspective exploded view of a frame and grate for one of the drains of FIG. **1**;

FIG. **3** is a perspective view of the grate of FIG. **2**;

FIG. **4** is a top plan view of the grate of FIG. **3** showing two latches being part of a locking mechanism for the grate of FIG. **2**;

FIG. **5**A is a view along line A-A of FIG. **4** showing one of the latches of the locking mechanism in a locked position;

FIG. **5**B is a view along line B-B of FIG. **4** showing one of the latches of the locking mechanism in an open position;

FIG. **6**A is a top plan view of an alternative embodiment for the grate with two latches being part of an alternative locking mechanism;

FIG. **6**B is a side view of the grate of FIG. **6**A;

FIG. **7**A is a view of detail A of FIG. **6**A; and

FIG. **7**B is a view of detail B of FIG. **6**B.

It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

DETAILED DESCRIPTION

Referring to FIG. **1**, a sewerage system **10** includes a plurality of interconnected pipes or conduits **12**, disposed underground vertically below a concrete or paved road **5**. A plurality of manholes **14** and drains **16** with inlets connect the sewerage system **10** to the road **5**. As illustrated in FIG. **1**, the drains **16** are located on lateral sides of the road **5** near sidewalks or curbs **7**, while the plurality of manholes **14** are found toward a middle of the road **5**. The plurality of manholes **14** have closed covers **18** which do not allow the passage of debris, while the drains **16** have open grated covers **50** which allow passage of excess water and small debris. The grates **50** (shown in detail in FIG. **3** and FIG. **6**) will be described below. It is contemplated that one, some or all of the plurality of manholes **14** could be provided with grated covers **50** instead of closed covers **18**.

A catch pit **17** is located under the inlet **50** of the drain **16** to receive the debris.

Turning now to FIG. **2**, each of the drains **16** includes a frame **20** onto which is received the grate **50** (as indicated by arrow **40**). The frame **20** has an open top **21** defined by a grate receiving contour **22**. The grate receiving contour **22** has a shape mating the outer shape of the grate **50**. The frame **20** includes walls **24** extending downwardly from the grate receiving contour **22**. The walls **24** are to be inserted into the catch pit **17**. Side flanges **23** extend laterally from the grate receiving contour **22**. The side flanges **23** help prevent water infiltration between the frame **20** and the concrete or asphalt pavement. The grooves **22** help water enter the catch basin by gravity.

Frame **20** shown herein is an autostable frame used on concrete roads, but it is contemplated that frame **20** could be used for other purposes. For example, frame **20** could be sealed directly to road **5**. Any frame having a contour with a shape mating the one of grate **50** could be used. As such, frame **20** could have a shape different from the one shown herein. For example, side flanges **23** and/or downwardly extending walls **24** could be omitted. The frame **20** may be a unitary piece or may be formed around the grate **50** a posteriori, such as by pouring concrete to surround grate **50** is in place. The frame **20** is made of ductile iron. It is contemplated that the frame **20** could be made of a material other than ductile iron. For example, the frame **20** could be made of metal, and/or a polymer and/or rubber and/or concrete, and/or any other material that would have some degree of flexibility.

Turning now to FIG. **3**, the grate **50** includes a grate frame **52** which has a shape matching a shape of the grate receiving contour **22** of the frame **20**. The grate frame **52** includes two straight longitudinal sides **52***a* and two curved lateral sides **52***b*. As mentioned above, the grate frame **52** may have a shape different from the one described herein depending on the shape of the grate receiving contour **22** of the frame **20**. This alternative shape could, for example, be circular or rectangular. The grate frame **52** includes two spaces (or openings) **53** disposed on the lateral sides **52***a* of the grate frame **52**. As will be described below, the spaces **53** allow elastic deformation of the grate **50**. It is contemplated that the grate frame **52** could have only one or more than two spaces **53**. It is also contemplated that some or all of the spaces **53** could be disposed on the longitudinal sides **52***a* of the grate frame **52**.

The grate **50** includes a plurality of bars **54** that together form a substantially crisscrossed arrangement. The substantially crisscrossed arrangement is achieved by a plurality of longitudinal bars **56** intersecting with a plurality of sideway bars **58**. The sideway bars **58** and the longitudinal bars **56** intersect at an angle of about 45 degrees so as to form a chevron pattern. Although the arrangement of the bars **54** is shown as forming chevrons in FIG. **3**, it is contemplated that the bars **54** could have other arrangements. Such arrangements could include, for example, perpendicularly crossing bars. In another example, the pattern is not geometrical.

The longitudinal bars **56** are fixedly connected to the grate frame **52**, while some of the sideway bars **58** are spaced from the grate frame **52** by spaces (or openings) **60**. It is contemplated that some of the longitudinal bars **56** could be spaced from the grate frame **52** and/or all of the sideway bars **58** could be fixedly connected to the grate frame **52**. Similarly to the spaces **53**, the spaces **60** allow elastic deformation of the grate **50**. The spaces **60** are shown herein to be located between the grate frame **52** and some of the sideway bars **58**, but it is contemplated that the spaces **60** could be located on a sideway bar **58** and/or on a longitudinal bar **56**. Some of the sideway bars **58**, indicated by reference numeral **57**, are fixedly connected to the grate frame **52** and spaced from the other sideway bars **58** by spaces (or openings) **59**. Similarly to the spaces **53** and **60**, the spaces **59** allow elastic deformation of the grate **50**. It is contemplated that some or all of the sideway bars **57** which are fixedly connected to the grate frame **52** could be fixedly connected the other sideway bars **58**.

The grate **50** is made of ductile iron which allows some elastic deformation. As such, the grate frame **52** can be modified to fit over the grate receiving contour **22** of the frame **20** should the grate receiving contour **22**, as it is the case in this embodiment, have a perimeter slightly smaller than a perimeter of the grate receiving contour **22**. In another embodiment, the grate receiving contour could have a perimeter slightly different than a perimeter of the grate receiving contour. By 'slightly', one should understand within the elastic deformation range of the grate. The elastic deformation is used to tighten the grate **50** against the frame **20** once the grate **50** is in place onto the frame **20**. As such, the grate **50** is made of a material that allows some elastic deformation but is not so elastic that the grate **50** could come off the frame **20** when in use. When a user wants to place the grate **50** onto the frame **20**, he/she pushes it against the frame **20**, thereby deforming slightly the grate **50** in a longitudinal plane P using the spaces **53**, **59** and **60**, and allowing the grate **50** to fit the grate receiving contour **22**. Once in place, the grate **50** being elas-

tically deformable, the grate **50** has a tendency to expand back to its original shape which exerts a force against the grate receiving contour **22** of the frame **20**, thereby providing some retention of the grate **50** to the frame **20**. In order to provide an additional amount of retention, a locking mechanism **100** is used.

Turning to FIGS. **5**A and **5**B, the locking mechanism **100** includes two blockers in the shape of latches **102** pivotally connected to the grate **50**. In the embodiment shown herein, the latches **102** are disposed in a vicinity of respective spaces **59** or **60**. The latches **102** have a thickness of about a width of their associated spaces **59**, **60**. The latches **102** are movable between an open position (shown in FIG. **5**B) where the latches **102** are not engaged in the respective spaces **59** or **60**, and a locked position (shown in FIG. **5**A) where the latches **102** are engaged in their associated spaces **59** or **60**. In the open position, the latches **102** are disposed at an angle with respect to the longitudinal plane P, whereas in the locked position, the latches **102** are contained in the longitudinal plane P. It is contemplated that the locking mechanism **100** could include only one or more than two latches **102**. It is also contemplated that the latches **102** could be connected to the grate **50** in a way other than by a pivot. For example, the latches **102** could be removable blockers connected to the grate **50** and be selectively inserted in the spaces **59** and **60**. It is also contemplated that the latches **102** could only act on spaces **59** or only on spaces **60**. The locking mechanism **100** may be embodied by types of blockers other than the ones described herein, as long as the blockers prevent, at least partially, elastic deformation of the cover they act on when in the locked position.

The grate **50** is typically installed on the frame **20** as described above with the latches **102** in the open position so as to allow elastic deformation of the grate **50** during its installation on to the frame **20**. To lock the grate **50**, the user pivots the latches **102** from the open position to the locked position. The user may have to use tools (e.g. hammer) to force the latches **102** in engagement with the spaces **59**, **60**. Once in the locked position, elastic deformation of the grate **50** is restrained, since the presence of the latches **102** in the spaces **59**, **60**, when in the locked position, induces an outward force directed toward the grate receiving contour **22** of the frame **20**.

Turning now to FIG. **6**A, an alternative embodiment for the grate **50** is shown. Grate **150** includes a grate frame **152** which has a shape matching a shape of the grate receiving contour **22** of the frame **20**. The grate frame **152** includes two straight longitudinal sides **152***a* and two curved lateral sides **152***b*. The grate frame **152** includes two spaces (or openings) **153** disposed on the lateral sides **152***a* of the grate frame **152**. The grate **150** includes a plurality of bars **154** that together form a substantially crisscrossed arrangement. The substantially crisscrossed arrangement is achieved by a plurality of longitudinal bars **156** intersecting with a plurality of sideway bars **158**. The sideway bars **158** and the longitudinal bars **156** intersect at an angle of about 45 degrees so as to form a chevron pattern. The longitudinal bars **156** are fixedly connected to the grate frame **152**, while some of the sideway bars **158** are spaced from the grate frame **152** by spaces (or openings) **160**. Some of the sideway bars **158**, indicated by reference numeral **157**, are fixedly connected to the grate frame **152** and spaced from the other sideway bars **158** by spaces (or openings) **159**. FIG. **6**B shows a side view of the grate **50**.

Locking mechanism **200** is used to secure grate **150** in frame **20**. The locking mechanism **200** includes two blockers **202**. The blockers **202** are disposed in a vicinity of respective spaces **159** or **160**. As shown in FIG. **7**A, the blockers **202** are selectively inserted in their associated spaces **159** or **160** to lock the grate. The blockers **202** can be made of ductile iron material. The blockers **202** can be secured to the grate frame **152** by fasteners **204** inserted in a respective aperture **206** of the grate frame **152** and hole **207** of the blocker **202**. The fasteners **204** can take on a plurality of forms, such as screws, pins, nails, etc. They can be threaded and/or tapered. If pins are to be used as fasteners **204**, taper pins, dowel pins, roll (spring) pins, hitch pins, clevis pins, etc. can be used.

In the example embodiment of FIGS. **6** and **7**, blocker **202** is inserted in the appropriate space **160** and apertures **206** are aligned with holes **207**. A clevis pin **210** is inserted in each set of aligned pin aperture **206** and pin hole **207** and thereby secures blocker **202** to grate frame **152** at two locations. Hitch pins **208** are inserted in clevis pins **210** to secure clevis pins **210** in pin apertures **206** and pin holes **207** and thereby to secure blocker **202** to grate frame **152**.

The frame **20** and the sewerage system **10** are only one possible embodiment where the locking mechanisms **100** or **200** could be used on a grate. The frame **20**, the sewerage system **10** and the grate **50** or **150** are used herein to describe a context in which the locking mechanism **100** or **200** could be used, but it is understood that the locking mechanism **100** or **200** could be used in a context widely different from the one described herein, as long as the locking mechanism **100** or **200** performs substantially in the same way as described herein. For example, the grate **50** or **150** could be a grate used in a ventilation system as opposed to a sewage system. Also, the locking mechanism **100** or **200** may be used on covers other than a grate as long as the cover has at least one opening disposed in a portion of the cover that is elastically deformable. For example, the locking mechanism **100** or **200** may be used on a cover that has only a portion of it being a grate.

Modifications and improvements to the above-described embodiments of the present may become apparent to those skilled in the art. The foregoing description is intended to be exemplary rather than limiting. The scope of the present is therefore intended to be limited solely by the scope of the appended claims.

I claim:

1. A cover and locking mechanism assembly comprising:

a cover including:

at least a portion able to undergo elastic deformation, the cover including at least one opening disposed at least partially in said at least portion of the cover; and

a locking mechanism including:

at least one blocker movable between an open position where the at least one blocker is disengaged from the at least one opening, and a locked position where the at least one blocker is engaged in the at least one opening, in the locked position the at least one blocker preventing at least partially elastic deformation of the at least portion of the cover.

2. The cover and locking mechanism assembly of claim **1**, wherein the cover is a grate, the grate includes a frame and a plurality of crisscrossly arranged bars extending within the frame.

3. The cover and locking mechanism assembly of claim **2**, wherein the at least one opening is disposed between two adjacent bars of the plurality of crisscrossly arranged bars.

4. The cover and locking mechanism assembly of claim **2**, the plurality of crisscrossly arranged bars forms a chevron pattern.

5. The cover and locking mechanism assembly of claim **2**, wherein the at least portion able to undergo elastic deformation is at least one first portion;

the at least one opening is at least one first opening;

the cover includes at least one second portion able to undergo elastic deformation; and

the cover includes at least one second opening disposed at least partially within the at least one second portion.

6. The cover and locking mechanism assembly of claim **5**, wherein the at least second portion able to undergo elastic deformation and the at least one second opening are disposed within the frame.

7. The cover and locking mechanism assembly of claim **5**, wherein the at least second portion able to undergo elastic deformation and the at least one second opening are disposed within the plurality of crisscrossly arranged bars.

8. The cover and locking mechanism assembly of claim **1**, wherein at least one of the at least one blocker and the cover is made at least partially of ductile iron.

9. The cover and locking mechanism assembly of claim **1**, wherein the at least one blocker includes at least one latch pivotally connected to the cover.

10. The cover and locking mechanism assembly of claim **9**, wherein the cover defines a longitudinal plane,

in the open position, the at least one latch is at an angle with respect to the longitudinal plane, and

in the locked position, the at least one latch is contained in the longitudinal plane.

11. The cover and locking mechanism assembly of claim **1**, wherein a thickness of the at least one blocker corresponds to a width of the at least one opening.

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